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Form Approved
OMB No. 0704-0188

1 to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, writing the collection of information. Send comments regarding this burden estimate or any other aspect of this form, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Ave., Washington, DC 20503.

DATE 00/00/81		3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE FISHERIES ASSISTANCE REPORT, ROCKY MOUNTAIN ARSENAL, 1981 ANNUAL REPORT		5. FUNDING NUMBERS	
6. AUTHOR(S) ROSENLUND, B.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) FISH AND WILDLIFE SERVICE LAKEWOOD, CO		8. PERFORMING ORGANIZATION REPORT NUMBER 86213R01	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ROCKY MOUNTAIN ARSENAL (CO.) COMMERCE CITY, CO		10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED			
13. ABSTRACT (Maximum 200 words) THIS ANNUAL REPORT CONTAINS SAMPLING INFORMATION ON VARIOUS FISH AT RMA DURING 1981. THE DOCUMENT DISCUSSES: 1. LEVELS OF CONTAMINATION IN THE FISH POPULATIONS OF VARIOUS LAKES 2. OBSERVABLE TRENDS 3. RECOMMENDATIONS FOR THE FUTURE 4. SCOPE OF WORK FOR 1982.			
14. SUBJECT TERMS LAKE MARY, LOWER DERBY, MERCURY		15. NUMBER OF PAGES	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

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Rocky Mountain Arsenal
Information Center,
Commerce City, Colorado

History

The Fish and Wildlife Service has been involved in the fisheries program at the Rocky Mountain Arsenal since 1960. From 1975 through 1981, most of our fisheries work has been directed toward the collection of fish for pesticide analysis and the monitoring of the abundance of selected fish species in Lake Mary, Ladora and Lower Derby Reservoirs.

Four reservoirs, (Lake Mary, 6 acres; Ladora, 63 acres; Lower Derby, 45 acres; and Upper Derby, 73 acres) have been associated with the Arsenal angling program. These reservoirs are located within the same drainage, and were contaminated with aldrin and dieldrin in the 1950's. This contamination resulted in the extensive loss of waterfowl. To help decontaminate these lakes, approximately six inches of bottom sediments were removed from Ladora, Lower Derby and Upper Derby and the inlet canals were filled. Apparently, the "decontaminated" lakes were restocked with fish in 1968.

Lake Mary was enlarged and deepened in 1975, with trout stocked on an experimental basis. The stocking of trout was discontinued when it was found that despite the sediment removal in Lake Mary, trout in 1977 were accumulating dieldrin as high as 2.00 ppm in the filets. The rate of dieldrin absorption in 1977 was also found to be very rapid. Of six rainbow trout examined after one month of exposure to Lake Mary in July 1977, 50% were found to have accumulated dieldrin concentrations in the filets that exceeded the 0.30 ppm FDA action level. Prior to stocking into Lake Mary, the study group of rainbows were found to be below detectable levels for dieldrin.

Current Fisheries Status

For some reason, data collected from 1978 through 1981, indicates that the amount of dieldrin in the filets of fish from Rocky Mountain Arsenal may be decreasing.

Lake Mary Of 38 trout sampled from Lake Mary in 1978, 21% of the trout filets met or exceeded the 0.30 ppm action level for dieldrin with a mean of 0.19 ppm. In 1979, the mean level of dieldrin decreased to 0.07 ppm, with none of the 23 trout sampled found to exceed the 0.30 ppm action level. By 1980, largemouth bass had totally displaced trout in Lake Mary. Of seven bass sampled in 1980, the mean dieldrin level was 0.06 ppm. In 1981, of 12 bass samples, none exceeded 0.08 ppm of dieldrin with a mean of 0.03 ppm.

Lower Derby. Although analysis of fish from Lower Derby is only available for 1979, 1980 and 1981, Lower Derby appears to have been the most heavily contaminated with dieldrin. In 1979, mean levels of dieldrin for largemouth bass and bullheads exceeded the 0.30 ppm dieldrin action level. Northern pike had a mean dieldrin level of 0.27 ppm in 1979. Of the 18 fish examined from Lower Derby in 1979, 56% exceeded the dieldrin action level, with dieldrin in the filet of one bullhead at 0.65 ppm. By 1980, only 13% of the 15 fish sampled had dieldrin levels at or above the action level, with the mean levels of dieldrin in all

species sampled well below the 0.30 ppm action level. In 1981, 10% of the 20 fish sampled barely exceeded the 0.30 ppm dieldrin action level, with mean levels of dieldrin for all species below the action level. Sampling indicates that the bullheads are tending to be the last reservoirs of the dieldrin; and infers that the dieldrin that remains in Lower Derby is mainly in the bottom plants, bottom animal material and sediments.

Ladora. In 1979, 1980 and 1981, the mean level of dieldrin in largemouth bass, bullheads, channel catfish and northern pike filets from Ladora was well below the 0.30 ppm action level. As in Lower Derby, bullheads tend to concentrate the dieldrin the most. However, the mean dieldrin levels for bullheads has not exceeded 0.03 ppm (1979). Of samples representing 63 fish from Ladora, only one bullhead has exceeded the dieldrin action level, with 0.40 ppm of dieldrin in the filet.

Mercury

Of some concern is the apparent upward trend in 1980 and 1981 of the concentration of mercury in the filets of most fish species sampled from Lake Mary, Ladora and Lower Derby. Since Upper Derby is often dry, it is not being sampled.

Mercury was below detectable levels in all species sampled from Ladora and Lower Derby in 1979. In 1980, of samples representing 57 fish, only 3 bass (5%) exceeded the 1.0 ppm FDA action level for mercury in the filets. One bass had a 15.3 ppm mercury level in the filet.

In 1981, of samples representing 60 fish, 11 samples (18%) exceeded the 1.0 ppm FDA action level for mercury. Although only bass from Ladora exceeded the mercury action level in 1980, the mean mercury level in bass from Lake Mary, bullheads from Lower Derby, and northern pike from Ladora exceeded the action level in 1981.

Bass from Lake Mary experienced the largest increase in mercury, with a mean of 0.175 ppm in 1980 and a mean of 1.47 ppm in 1981.

Fish Populations

In the early 1970's, Ladora and Derby Reservoirs provided excellent angling for largemouth bass and "jumbo size" bluegills (Mullen, 1975). However, by 1975, bullheads had become established in large numbers, and the splendor of the bass and bluegill fisheries had declined significantly. In an attempt to improve the fisheries in Ladora and Derby Reservoirs, the stocking of northern pike was resumed from 1975 through 1977.

Experimental gill nets set overnight at the same locations from 1978 through 1981, show that the bullheads have continued to dominate Ladora and Derby Reservoirs, with 62 to 77 bullheads captured in each net set for the last four years. Compared to bullheads collected in 1975, the mean size of the bullheads has increased from near eight inches in 1979 to ten inches by 1981.

Northern pike appear to be having limited spawning success, particularly in Lower Derby when the water level remains near capacity. Most northern pike captured in gill nets now range from 17 to 27 inches in length. Northern pike appear to be feeding mainly upon white suckers and bluegills.

The number of largemouth bass captured in gill nets from 1978 through 1981 is relatively low, with one to seven bass taken per net. The size of the bass range from 6 inches up to 15 inches, with a K factor of 1.4 for bass over 14 inches in length. Largemouth bass appear to be mainly feeding upon bluegills in Ladora and Derby Reservoirs.

By 1980, largemouth bass had become dominate in the once put-and-take trout fisheries of Lake Mary. The bass in Lake Mary are numerous, with few bass exceeding eight inches in length with a K factor of 1.25 by June 1981. Lake Mary appears to lack a large forage fish population, with the bass mainly utilizing invertebrates.

Discussion

Although the amount of dieldrin in fish filets appears to be decreasing, the mercury levels in fish filets appear to be increasing, particularly in the predator species. The reason for the apparent decline in dieldrin and the increase in mercury is not known. The persistence of high levels of dieldrin in some of the bottom feeding fishes infers that most of the dieldrin may now be tied up in the bottom sediments. Since large bullheads are not being utilized as forage fish, dieldrin levels appear not to be increasing up the feed chain. Other bottom feeders, such as diving ducks, could also be concentrating dieldrin.

Mercury appears to be on the increase, particularly in predator species. However, the presence of high mercury levels in some bullheads in 1981, indicates that individuals feeding at any trophic level may be exposed to high levels of mercury at the Arsenal.

Although we have only discussed the major contaminants, the presence of low levels of aldrin, endrin, isodrin, DDE and DDT within wildlife at the Arsenal could be additive in their effects. Along with dieldrin and mercury, the accumulative presence of other low level contaminants could represent an additional, but undetermined, risk.

Recommendations

Rocky Mountain Arsenal should remain closed to angling, except on a strictly enforced catch and release basis. Presently, the Arsenal is open to catch and release fishing, with anglers required to obtain a permit. Since largemouth bass and northern pike have been shown to concentrate dieldrin and mercury, and are attractive species to anglers, anglers should be informed that some individual bass and pike can be highly contaminated.

We feel that ideally, the aquatic sampling program should be expanded to include invertebrates, minnow species, aquatic vegetation, plankton, bottom sediments and water analysis. This type of sampling program could show the avenues of pesticide concentration, and would provide a better overall understanding of the problems posed to all wildlife in Lake Mary, Ladora and Lower Derby.

The routine sampling of fish populations at Rocky Mountain Arsenal should also continue. This sampling not only provides fish for pesticide and heavy metal analysis, but monitors the abundance of several fish species. Variations in the abundance and condition of the species could indicate environmental problems on the Arsenal that would warrant investigation.

The water level of Lower Derby Reservoir is very low as of April 1982, with some concern expressed as to the fate of the fish population. Due to the possible presence of high concentrations of pesticides within the bottom sediments of Lower Derby Reservoir, haul seining is not recommended. If labor is available, fish may be salvaged from Arsenal reservoirs by using fyke nets, or gill nets set for short periods of time.

1982 Funding and 1982 Scope of Work

Due to recent reductions in funding for the Fish and Wildlife Service, Fisheries Assistance work can no longer be provided to agencies, unless the agency is willing to provide some funding to the Fish and Wildlife Service.

If the Arsenal is willing to transfer \$700 to the FWS, the following fisheries work will be completed during FY82.

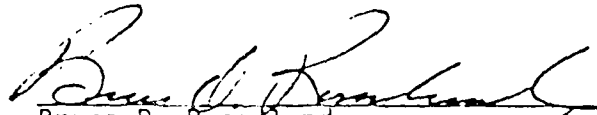
1. Gill net Lake Mary, Ladora and Lower Derby Reservoirs following the procedures used since 1978. Fish collected will be made available to the Arsenal, or other Cooperators, for pesticide analysis. Data on species, length, weight and food utilization will be collected.
2. Collect and identify species of forage fish (fyke nets and minnow traps) for pesticide analysis.
3. Collect plankton samples from Lake Mary, Ladora and Lower Derby Reservoir for pesticide analysis.
4. Collect, and identify, aquatic vegetation samples for pesticide analysis.
5. Collect, and identify, invertebrate samples from Lake Mary, Ladora and Lower Derby.
6. Report findings of survey to the Arsenal.

So that the fish collection data will be comparable with other data collected since 1978, most sampling should be completed by June 15, 1982. Reports will be due by March 1, 1983, if the results of the pesticide analysis are complete by February 1, 1983.

Funds can be easily transferred from the U. S. Army, Rocky Mountain Arsenal, to the Fish and Wildlife Service by the use of a Support Agreement. An example of a Support Agreement is attached.

If the Arsenal wishes to continue the use of U. S. Fish and Wildlife Service's Fisheries Assistance, the Arsenal should contact the Fish and Wildlife Service as soon as possible so that fish collections can be completed by June 15, 1982.

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